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RTW WORKSHOP REPORT

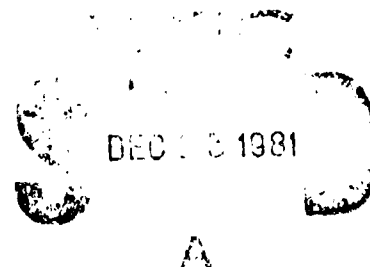
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UNITED STATES AIR FORCE  
Hanscom Air Force Base, Massachusetts



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#### REVIEW AND APPROVAL

This technical report has been reviewed and is approved for publication.



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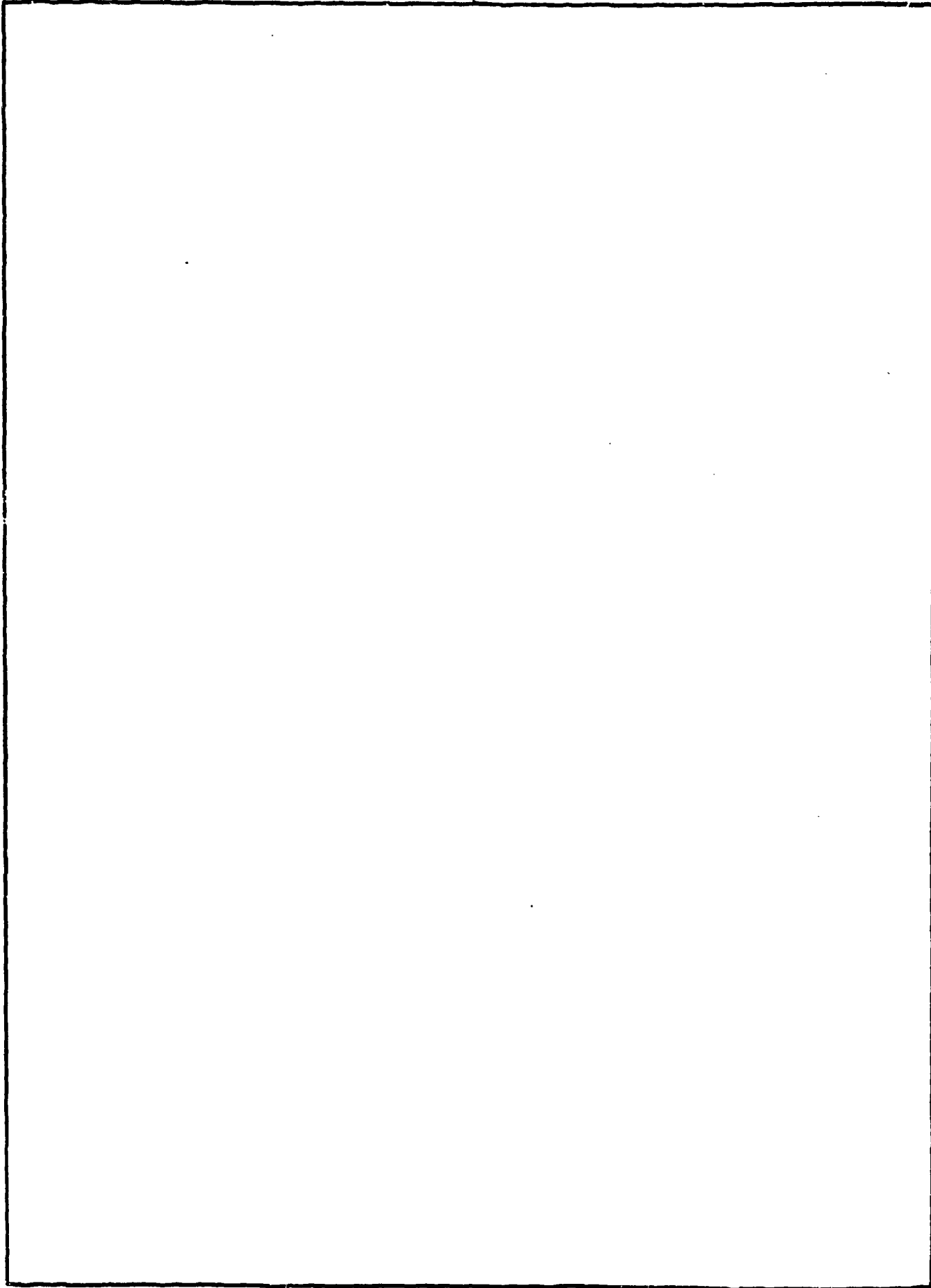
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) A reliability improvement warranty (RIW) workshop was convened on 9-10 December 1980 at The MITRE Corporation, Bedford, Mass., to explore the feasibility of RIW for current and future production JTIDS contracts. In particular, RIW suitability for the Class 1 JTIDS production buy was discussed. The consensus of the group was that RIW is not appropriate for the Class 1 production buy, but that it can be useful on other programs including Class 2 JTIDS if certain conditions are met and the RIW contract is tailored to the program.		

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## TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
LIST OF TABLES	vi
1 INTRODUCTION AND PURPOSE	1
2 RESULTS	2
General	2
Class 1 Applicability	5
3 SUMMARY	8
APPENDIX A RIW WORKSHOP ATTENDEES	9
APPENDIX B RIW WORKSHOP AGENDA	10
RIW HANDOUTS	10
APPENDIX C INTRODUCTORY SLIDES	11
APPENDIX D SAMPLE RIW CONTRACT	14
APPENDIX E RIW CONTRACT OUTLINE WITH QUESTIONS AND DISCUSSION TOPICS	36
APPENDIX F ADDITIONAL WARRANTY/INCENTIVE ISSUES AND PROBLEMS	46
APPENDIX G LETTER OF INVITATION	47
APPENDIX H TABLE OF ACRONYMS	50

## LIST OF TABLES

<u>Table</u>		<u>Page</u>
I	MTBF Guarantee	35
II	Turnaround Time Guarantee	35

## SECTION 1

### INTRODUCTION AND PURPOSE

MITRE was asked by the JTIDS Program Office in August 1980 to conduct a cost/benefit study to determine a range of field reliability improvement versus investment cost for the HIT Class 1 terminal. The HIT was about to enter the production phase (Low Rate Initial Production - LRIP), but the JPO nevertheless indicated that the application of a Reliability Improvement Warranty (RIW) or an RIW/MTRF Guarantee to the FY 82 buy may be desirable.

As part of the effort, an RIW Workshop was scheduled for 9-10 December 1980. The purpose of the workshop was to convene a small group of Government personnel with experience on RIW, incentives and guarantee programs in an informal working atmosphere, so that the advantages and disadvantages, pros and cons, and the pitfalls of these types of programs could be thoroughly discussed. Our objective was to determine the feasibility of applying RIW on current and future production JTIDS contracts and, in particular, to determine its suitability for the Class 1 JTIDS production buy.

Approximately 25 individuals outside MITRE/JPO were invited. The list of attendees numbered 19 (Appendix A), of whom 10 were from agencies outside of MITRE and the JPO.



## SECTION 2

### RESULTS

#### General

In order to focus the workshop and try to maximize the useful information exchange, the authors obtained a sample RIW contract (Appendix D) organized it into outline form with questions and discussion topics (Appendix E), and led the group discussion through all the paragraphs. This proved to be a useful format, which, in combination with specific discussion of our Class I situation and considerable open discussion of attendees' experiences on other programs, made for a productive two-day meeting.

If only one conclusion could be drawn from the Workshop, it would be that warranties, particularly RIW, and incentives are promising but they are not panaceas for poor inherent reliability. Having had several years of experience with these new types of programs, the attendees described the problems they had encountered and highlighted some of the pitfalls. It appears that the contractual aspects pose bigger problems than technical considerations. The general consensus was that each type of incentive or guarantee plan has its own advantages and disadvantages, and that these must be tailored to the particular development and production program. To be successful such contracts require the cooperative efforts of technical and contractual personnel.

Emphasizing the need to resolve the contractual issues, a Warranty Information Center (WIC) is being established at Wright-Patterson Air Force Base to assist the procurement agencies in writing incentive and/or guarantee contracts. It will also be a data center for all program information and experience relating to warranties and guarantees. The Center probably will be a joint Systems Command/Logistics Command facility. Current plans are to have it operational by the Spring of 1981.

Other conclusions and observations from the Workshop are the following:

1. It is not easy to delineate differences between a warranty and a guarantee. Basically, a warranty implies a form of item correction/replacement ("a maintenance contract") and a guarantee implies an incentive (positive or negative) plus mandatory design improvements to meet required performance levels.

2. If the inherent reliability of an item has not been reached, RIW can help achieve it. If the inherent value has been reached, RIW can be used to maintain it at that level. It was noted that other types of contractor support may be as effective and less costly for maintaining an achieved level of reliability.

3. Effective use of ICS (Interim Contractor Support), including provisions for spares and repair turnaround time, can provide Operational and Support (O&S) results similar to those obtained using RIW.

4. Warranties do not obviate the need for qualification tests and reliability demonstration tests. The Government must know the capability of the system before it can make a production decision and before it can set the Warranty or Guarantee level.

5. The Government must be careful not to include a Correction of Deficiencies (COD) clause in an RIW contract. Otherwise a contractor may try to process Engineering Change Proposals (ECPs) under the COD clause where costs are shared.

6. A cost-plus contract and RIW are incompatible. RIW-related changes are no-cost ECPs, whereas under cost-plus, change costs are shared.

7. A factor that argues against long term RIW contracts is that it has been found that most RIW and COD changes are processed during the first 12-18 months of the production contract. In fact, the TACAN ARN-118, which is often cited as the example of a successful RIW program, has not processed a single Class I design-related ECP during the warranty period to improve its reliability. Reliability was improved by adding burn-in, screening, and other lower level corrective actions. These changes are producibility improvements rather than design improvements. Westinghouse reported\* similar

\* Reported during discussions at the 1981 Annual Reliability and Maintainability Symposium, held in Philadelphia, Pa., on 27-29 January 1981.

results for the warranted portion of the F-18 radar program. They processed only 2 design-related ECPs during the early part of the RIW program.

8. One of the shortcomings of RIW is the potential for lack of contractor motivation for improving the equipment reliability when it is meeting its reliability requirements. Similarly, if the contractor is meeting a guaranteed reliability value, he will not be motivated to make improvements. The contractor would try to profit from such changes with a VECF or an ECP.

9. Literature on RIW states that at the start of the development phase of a program, it is sufficient for the Government to indicate its intent to consider RIW during production. Those at the workshop said, "not so." Unless there is money set aside in the budget to pay for RIW, all the up front planning might be a useless exercise. In this regard, they concurred, it is important to have the RIW option (or any incentive) priced with the technical proposal. In order for the contractor to price the RIW for production it is necessary for the buyer to define and include a production or field reliability parameter, e.g., MTBM or MTBCF (Mean-Time-Between Maintenance or Mean-Time-Between-Critical-Failures).

10. If incentives are to be considered on a program, it is important to maintain competition among contractors as long as possible in order to set the warranted or incentivized requirements as high as possible and to minimize Government penalties and risks.

11. Some of the problems found with RIW include the following:

- a. Much of the operating time data on returned warranted items is missing or incomplete (e.g., 65% missing on the ARN-118) so that the data base used to develop RIW/guarantee statistics is limited. This is a management problem that only the user can solve. Current reporting is based on averages calculated from the available data.
- b. Information later obtained from Westinghouse\* indicated they had no problem obtaining operating time data because they had elapsed time indicators installed in every warranted item.

\* Reported during discussions at the 1981 Annual Reliability and Maintainability Symposium, held in Philadelphia, Pa., on 27-29 January 1981.

- c. It is difficult to quantify the exclusion costs - failures excluded from warranty provisions - included in the RIW price. These costs are included, however, in the overall RIW cost and the Government pays for them one way or another.
- d. Unverified failures - failed items that have been returned but operate satisfactorily on retest - are an Air Force-wide problem that is getting increased visibility under RIW. If the percentage of unverified failures exceeds an agreed-to level, the Government pays a penalty. It was noted that a tolerable level ranges from 10-30% of the total returns.
- e. Items covered under RIW sometimes have been inadequately defined. All items must be delineated and all terms must be completely and accurately defined in the RIW contract.

12. The Government is constrained from contracting for follow-on RIW contracts because these are considered equivalent to service contracts. Therefore, following the initial warranty period, the Government should plan for transitioning from warranty maintenance to either Government or contractor support maintenance unless special conditions make it advantageous to continue with an RIW program.

#### Class 1 Applicability

As indicated above, one of the objectives of the Workshop was to determine the feasibility of applying RIW or RIW/MTBF-Guarantee to the FY 82 HIT Class 1 terminal buy. The group concurred that RIW or RIW/MTBF is not the best approach for the HIT production contract for the following reasons.

- a. It is not clear that HIT terminals have a reliability problem. We described the IOT&E experience at Eglin in some detail and the group felt (as do we) that, while the observed incidents apparently are real system problems, there may well be no hardware reliability problem. It is believed that the reported system failures were largely due to recurring software problems induced by maximum system loads, and to rack and cable problems which are being corrected. We agreed that more extensive integration testing was needed prior to IOT&E, and that specific testing should be performed to verify software fixes.

- b. RIW would have no effect on any software problems that contributed to poor observed field reliability. This is a problem that could be handled by having an integrating contractor responsible for total system performance during field testing of the combined ASIT and HIT systems, or otherwise, by conducting adequate stress (loading) tests during system integration.
- c. Similarly, system level interface problems would best be resolved by adequate system tests.
- d. The IOT&E tests at Eglin were brief so that the HIT field failure data is insufficient to establish a baseline for an RIW contract.
- e. The production decision for the E-3A has already been made so that the RIW contractor may not be easily motivated to improve the design.
- f. RIW can only help achieve the inherent reliability (MTBF) of a given system design or maintain whatever reliability exists. A reliability cliché says that reliability cannot be tested in; it must be designed in. Although it was agreed that RIW is not the path to follow for Class 1, there appears to be a need to improve the observed field reliability of the ASIT/HIT system. This could be accomplished by contracting for a specific improvement program, e.g., a TAAF program.

Finally, even if the Class 1 Terminal were to meet its reliability requirement, it may be possible that dollars can be saved by improving the MTBF. This saving would occur when the cost of the improvement program is significantly less than the system life cycle cost (LCC). MITRE has undertaken to explore this possibility via simulation runs using a modified ARINC Class 1 LCC model. Results of this effort should be available before 1 June 1981.

As an alternative to RIW for HITs, if there is a reliability shortfall, a system improvement program could be implemented wherein a contractor would be funded to do the job with incentives based on accomplishment. As part of this improvement program, the required MTBF can either be specified as a single value or as growth steps to be achieved over a period of time.

As a second alternative, the use of an integrating contractor with total system performance responsibility (TSPR), following standard engineering procedures (fault analyses followed by ECPs), would go far towards improving the system reliability in the field. Production reliability sampling tests would still be necessary to test the effects of both Government directed changes and changes resulting from the ECPs. Both of these alternatives would utilize TAAF, a testing program usually conducted during development wherein all failures are analyzed by the contractor and corrections are fed back into the system in a timely manner. Cumulative MTBF vs time is plotted and the MTBF growth is monitored to determine the effect and efficiency of the TAAF program.

## SECTION 3

### SUMMARY

Most of the problems that have surfaced during the implementation of RIW to date have been contractual, not technical. These problems have tempered initial enthusiasm for incentive programs with a degree of caution. To help resolve such problems for new Air Force programs, assistance will be available from the Warranty Incentive Center (WIC) to be established at Wright-Patterson Air Force Base in the near future. The authors believe incentive contracts can be made effective in improving delivered system field reliability and reducing Life Cycle Costs (because O&S cost reduction should exceed the increase in initial acquisition costs due to warranty cost).

One of the major conclusions of the Workshop attendees was that, for RIW to be an effective contract option, it is necessary that it be included as a contract task and that it be priced in the Contractor's proposal.

Because the Class 1 JTIDS terminal programs had done neither of the above, and because part of the planned terminal production is already on contract, the Workshop attendees concurred that RIW was not an appropriate option.

The JTIDS Class 2 terminal program has included a task for the Contractor to study performance incentive options for possible use in production. These options however were not priced with the proposal. This will make it more difficult to negotiate such a program later on, but the consensus was that the potential payoff was clearly worth the effort.

## APPENDIX A

### RIW WORKSHOP ATTENDEES

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Stanley J. Polak	MITRE	617-271-3242
Madhukar Joshi	MITRE	617-271-2080
John H. James	MITRE	617-271-2449
E. Fiorentino	RADC	315-330-3476
Lt. Col. M. F. Goldstein	ASD/AEK	AV-785-3385
John L. Max	AFLC/LOLCP	AV-78-76335
Robert E. Kiblinger	AFALD/PMYX	AV-78-53329
Fred Conway	AFALD/XRSA	AV-78-55146
Porter Osby, Jr.	AFLC/LDLCP	AV-78-76335
E. Joseph Albergo	AFALD/AQE	AV-478-3556
Maj. Paul R. Weaver	AFALD/AQE	AV-478-3556
Frank B. Van Horn	ESD/TOET	AV-478-4913
Van Feltham	ESD/TOET	AV-478-4913
Robert P. Savoy	ESD/DCBC	617-271-3778
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## APPENDIX B

### RIW WORKSHOP AGENDA

WELCOME	W. F. LYNCH
WORKSHOP INTRODUCTION	W. P. CROSSLEY
PARTICIPANT INTRODUCTIONS	GROUP
WORKSHOP HANDOUTS	
RIW CONTACT REVIEW	GROUP
ARINC RIW PRESENTATION	DR. H. BALABAN*
PARTICIPANT TOPICS	GROUP
. APPLICABILITY TO JTIDS	S. A. GREENBERG
WORKSHOP FINDINGS	GROUP

\*LATE CANCELLATION

### RIW HANDOUTS

- SAMPLE RIW CONTRACT
- CONTRACT OUTLINE IN WORKSHEET FORM WITH QUESTIONS
- ADDITIONAL WARRANTY/INCENTIVE ISSUES AND PROBLEMS
- MITRE MTR-3870
- VUGRAPHS

## APPENDIX C

### INTRODUCTORY SLIDES

SLIDE 1

#### RIW WORKSHOP

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SLIDE 2

- PURPOSE - ASSESS EXPERIENCE WITH WARRANTIES, INCENTIVES AND GUARANTEES
- DETERMINE FEASIBILITY OF APPLYING RIW ON CURRENT AND FUTURE PRODUCTION CONTRACTS
- 

SLIDE 3

- CONTRIBUTE TO A DETERMINATION OF RIW SUITABILITY FOR THE CLASS 1 JTIDS PRODUCTION BUY
- 

SLIDE 4

- WHY THE INTEREST IN WARRANTIES OR INCENTIVE PLANS?
- 

SLIDE 5

- BEGUN BY COMMERCIAL AIRLINES (FOR AVIONIC EQUIPMENT)
- o WARRANTED AIRLINE EQUIPMENT GETS 2-4 TIMES THE RELIABILITY AT 15-55% LOWER COST THAN EQUIVALENT MILITARY EQUIPMENT
- 

SLIDE 6

- US NAVY LEADING MILITARY IN RIW
- o AJB-3 GYRO
  - o F14 HYDRAULIC PUMP
  - o AV-8A HYDRAULIC PUMP
  - o APN-154 RADAR BEACON SET

SLIDE 6 (Concluded)

- US ARMY BEGAN RIW 1975
    - o ARN-123 RECEIVER
    - o R-1963/ARN GLIDESLOPE BEACON RECEIVER
  - US AIR FORCE FORMALLY EVALUATING RIW 1974 - 1983
    - o PRELIMINARY CONCLUSIONS: "SOUND AND EFFECTIVE WHEN PROPERLY APPLIED"
- 

SLIDE 7

- 3/76 COUNCIL OF DEFENSE SYSTEMS AND INDUSTRY ASSOCIATION (CODSIA) REPORT CONCLUDED, "RIW IS A VIABLE WARRANTY CONCEPT THAT SHOULD AND WILL BE EXPANDED UPON IN THE COMING YEARS AS EXPERIENCE AND CONFIDENCE IS GAINED"
  - ABOVE REPORT ALSO NOTED THAT 30% OF THE LIFE CYCLE COST OF A SYSTEM IS SPEND ON THE INITIAL PROCUREMENT; 70% IS SPENT ON OPERATIONAL AND SUPPORT COSTS
- 

SLIDE 8

JTIDS RELIABILITY PROGRAMS

- o PRELIMINARY IOT&E (EGLIN DATA):
  - MTBCF (EVERY INCIDENT COUNTS)  $\approx$  10 HOURS
  - OBSERVED MTBM (NO SPEC REQUIREMENT)  $\approx$  80 HOURS
  - OBSERVED FIELD MTBF (CONTRACTOR DEFINITION OF FAILURE)  $\approx$  400 HOURS
- o RELIABILITY PROGRAMS IN ACCORDANCE WITH MIL-STD-785
- o RELIABILITY TESTING IN ACCORDANCE WITH MIL-STD-781 BUT FOR CLASS 2, POSSIBILITY OF SUBSTITUTING THE MIL-STD-1635 GROWTH TEST FOR ONE OF THE MIL-STD-781 TEST PLANS
- o RELIABILITY PREDICTIONS IN ACCORDANCE WITH MIL- R-217
- o PROVISION FOR PRODUCTION RELIABILITY TESTING

SLIDE 9

RELIABILITY BACKGROUND  
CLASS 1 TERMINAL

- o MTBF REQUIREMENTS            350 HOURS, AIRBORNE  
                                     630 HOURS, GROUND
- o PRELIMINARY IOT&E (EGLIN) DATA:
  - MTBF (EVERY INCIDENT COUNTS)  $\approx$ 10 HOURS
  - OBSERVED MTBM (NO SPEC REQUIREMENT)  $\approx$ 80 HOURS
  - FIELD MTBF (CONTRACTOR DEFINITION OF FAILURE)  $\approx$ 400 HOURS

## APPENDIX D

### RELIABILITY IMPROVEMENT WARRANTY (SAMPLE CONTRACT, OBTAINED FROM WRAFB)

#### 1.1 GENERAL

##### 1.1 INTRODUCTION

The purpose of this document is to describe the Reliability Improvement Warranty (RIW) with which the contractor is required to comply for the Equipment procured under this contract and options thereto. This document specifies the extent of coverage, the period of coverage and the liabilities and obligations of the contractor and the Government's basic obligations under the warranty are set forth in the following ten parts.

1. General
2. Statement of Contractor Warranty
3. Government Obligations
4. Contractor Obligations
5. Turnaround Time Guarantee
6. Government Spares Requirements
7. Total Operating Hours
8. MTBF Guarantee
9. Price Adjustment of RIW
10. RIW Calculations

#### 1.2 OVERVIEW

1.2.1 Basic Requirements - Under the RIW defined herein, the contractor will be required to correct or replace, at no additional cost to the Government, any equipment which fails during the warranty period. The Government reserves the right to approve all Engineering Change Proposals (ECPs). Maximum latitude will be given to the contractor to make no-cost changes to improve reliability and maintainability.

1.2.2 Period/Use Rate - This warranty is for a (5) year period commencing with a final Government acceptance without deviation or waiver of the first production delivery after kit proofing.

The projected use rate for each equipment is \_\_\_\_\_ operating hours per installation per month. Provisions are contained herein to adjust the contract price if the use rate varies significantly from the projection.

- 1.2.3 Asset Management - The Government will be responsible for managing the spare Line Replaceable Unit (LRU) and Shop Replaceable Unit (SRU) inventories. The Government, based on operational use, proposed reliability and length of logistic pipeline, will purchase and place in inventory at various base locations and the contractor's facility a quantity of spare LRUs/SRUs which is consistent with the schedule for new installs. When a demand exists in the field, the contractor will be notified of the requirement and he will promptly ship an available replacement. The contractor's obligations as described herein, however, are not affected by the quantity of spares unilaterally positioned at any location by the Government.
- 1.2.4 Consignment Spares - The contractor will be required to provide consignment (no-charge/loan) spares at specified intervals if his actual measured LRU/SRU Mean Time Between Failure (MTBF) is less than the guaranteed MTBF or if the contractor's actual turnaround time is greater than the guaranteed turnaround time and a demand has not been filled.
- 1.2.5 Configuration Update - The contractor will be required at no additional cost to the Government to bring all units delivered up to the latest approved configuration by the end of the warranty period or provide modification kits and data within the time specified.

### 1.3 DEFINITIONS

For the purposes of the warranty, the following definitions shall apply.

- 1.3.1 Equipment shall mean the LRUs/SRUs consisting of the following:
  - a.
  - b.
  - c.

d.

e.

- 1.3.2 Line Replaceable Unit (LRU) is a major assembly of a system/subsystem which is removed and replaced by organizational/flightline maintenance personnel.
- 1.3.3 Shop Replaceable Units (SRU) are assemblies, subassemblies, modules or circuit boards that are removed and replaced in an intermediate or depot level maintenance shop.
- 1.3.4 Reporting Period is the period of time over which reliability and logistics information shall be summarized for reporting purposes. The reporting period for this contract shall be 6 months.
- 1.3.5 Failures - An equipment failure shall be any removal and replacement of equipment from an aircraft because it does not perform in accordance with contract specifications as determined by the Government using Intermediate Maintenance Technical Order Procedures (Reference CDRL Item \_\_\_\_). The only allowable exceptions are denoted in paragraph 2.6.
- 1.3.6 MTBF - Mean Time Between Failure in equipment operating hours. Equipment MTBF is defined to be the total operating hours accumulated on all like units during a measurement period divided by the total number of failures of all such units during that specified period.
- 1.3.7 Guaranteed MTBF shall be that operational MTBF (see Table I) proposed by the contractor and guaranteed in accordance with the terms and conditions of Part 8 hereof.
- 1.3.8 Measured MTBF shall be the Total number of Operating Hours (TOH) during a reporting period, divided by the total number of failures experienced during the same period. Computations shall be in accordance with Part 8 hereof.
- 1.3.9 Total Operating Hours (TOH) of the equipment during the reporting period being measured shall be the total number of equipment operating hours accumulated during the reporting period. The quantity of TOH is determined in accordance with paragraph 7.1 and 7.2.

1.3.10 "Days" shall mean calendar days.

1.3.11 ETI - Elapsed Time Indicator.

2.0 STATEMENT OF CONTRACTOR WARRANTY

2.1 Warranty - The contractor warrants that all Equipment as defined in paragraph 1.3.1 furnished under this contract and options thereto shall be free from defects in design, material and workmanship and shall operate in its intended environment in accordance with contractual specifications and Technical Orders for the period of 60 months following the date of final Government acceptance without deviation or waiver of the first production kit delivery after kit proofing. The equipment does not operate in its intended environment if there is a failure determination by the Government as defined in paragraph 1.3.5 hereof.

2.2 Rights & Obligations - Notwithstanding the provisions of the "Inspection" (1958 May) Clause (ASPR 7-103.5(a)) regarding the conclusiveness of acceptance and the waiver of defects which are susceptible to discovery prior to acceptance, the contractor shall be obligated to repair or replace any defective equipment in accordance with the terms and conditions of the warranty. The rights and obligations of the parties under this warranty are in addition to and independent of the rights and obligations of the parties under the other provisions of this contract. Except as provided by the general provision of this contract entitled "Inspection", the contractor's obligations and the Government's remedies for repair and replacement of defective Equipment covered by this warranty and failure of such Equipment are solely and exclusively stated herein. In no event shall the contractor be liable for special, consequential, or incidental damages resulting from the failure of such equipment.

2.3 Repair or Replace - Any Equipment furnished under this contract which fails to meet the warranty, will be shipped in approved shipping containers, to the Contractor's designated repair facility at Government expense. This equipment shall be corrected and modified or replaced, so as to operate in accordance with the Government approved Production Acceptance Criteria (DI-T-3174A). The Government reserves the right to perform inspections at the contractor's repair facility to verify failures and corrective action. The Equipment so



corrected or replaced shall likewise be warranted and be delivered to the Government in an approved shipping container. Shipment shall be at Government expense.

- 2.4 Warranty Coverage - Both the Government and the contractor assume that any unit delivered under this contract and returned to the contractor's repair facility during the warranty period is covered under this warranty and that only the exclusions listed in paragraph 2.6 shall void the contractor's responsibility to test, repair or replace nonconforming units at no increase in contract price under this warranty. The Administrative Contracting Office (ACO) shall promptly determine whether any of the exclusions apply to a returned Equipment upon receipt of the contractor's claim accompanied by clear and convincing evidence. If the ACO agrees that correction is not within the terms of this warranty, he may direct the contractor to repair the equipment and in such case, an equitable price shall be negotiated for its correction. In the event the ACO does not agree with the contractor's claim, the claim and supporting documentation will be forwarded to the PCO who will render a final decision. Equipment so repaired shall be warranted for the remainder of the warranty period.
- 2.5 Non-Correctables - If the PCO determines that the damaged equipment is not covered within the terms of the warranty and is not correctable, the equipment shall be disposed of as directed by the PCO. Equipment disposed of in accordance with this provision or equipment declared lost, may be replaced at the Government's option with new Equipment. Equipment so replaced shall be purchased at the most recent contract unit price for that unit subject to, if applicable, the Economic Price Adjustment Clause, and shall be covered by this warranty until the end of the warranty period.
- 2.6 Exclusions - The contractor shall not be obligated to repair or replace at no cost to the Government any Equipment warranted hereunder which is lost or damaged by reason of fire, explosion, submersion, Acts of God, an aircraft crash, enemy combat action, or unauthorized maintenance (see 3.2d) by Government personnel provided there is clear and convincing evidence of such cause, unless such loss or damage (except Acts of God) occurs on premises owned or controlled by the

contractor or unless the occurrence of fire or explosion was a result of non-conformance of the warranted equipment with the contractual specifications. The contractor shall not be obligated under these warranty provisions for:

(a) Repair of external physical damage caused by accidental or willful mistreatment by noncontractor personnel, or

(b) Repair of internal physical damage which, in the determination of the Government, has been solely caused by accompanying external damage, mistreatment or unauthorized maintenance by noncontractor personnel as specified in 3.2(d).

2.6.1 Seals - The contractor may provide and install seals for warranted items to control unauthorized repairs/tampering. The design of the seals should be such that inadvertent seal breakage will not occur under authorized maintenance procedures (i.e., conformal coating may be considered a suitable means of sealing warranted items). Broken warranty seals shall not automatically void the warranty. Clear and convincing evidence of internal access and either mistreatment and/or unauthorized maintenance are necessary to void the warranty.

2.7 Repair Parts - The contractor shall be responsible for obtaining replenishment and expendable spare parts for use in repair and/or modification of the Equipment. These parts (CFE) shall remain the property of the contractor until incorporated into Government owned Equipment at which time they shall become Government property, subject to the terms and conditions of the warranty. All such parts removed during repair and/or modification become the property of the contractor.

2.8 Unverified Failures - Any cost of receiving, testing and preparation for reshipment of equipment in which no malfunction can be verified at the contractor's facility shall be borne by the contractor. All unverified failures over 10% of units returned during the measurement period shall be counted as failures for the purpose of calculating MTBF.

2.9 Secure Storage - The Government will purchase spare Equipments under this contract. Those identified by the Government for pipeline use shall be placed in inventory in a secure storage area (i.e., bonded storeroom) at the contractor's

facility(s). The contractor shall be responsible for managing and maintaining the Government spares inventory located at his facility(s) during the period of the contract. Property control will be IAW ASPR Appendix B, "Manual for Control of Government Owned Property in Possession of Contractors". In the event of a conflict between the provisions of this warranty and ASPR Appendix B, ASPR shall govern.

- 2.9.1 Distribution Point - The bonded storage area will function as a contractor storage and distribution point. Stock Record Account Number (SRAN) FY\_\_\_\_\_ and Routing Identifier Code FHZ are assigned for identification purposes for the contractor's facility. In the event a backup repair facility and bonded storage area are activated, telephone information will be used in lieu of AUTODIN/Advanced Records System.
- 2.9.2 Transaction Reporting - The contractor shall transmit/receive all required data/transactions essential to the Government administrative/accountable storage site; i.e., receipt, storage, shipment, material identification/condition, inventory accuracy and asset/transaction visibility as detailed in DI-L-30320(A). The contractor shall transmit/receive transaction data (MISTRIP/MISTRAP) through Government Furnished AUTODIN/Advanced Record System facilities.
- 2.10 Failure Notification - After a failure occurs in the field, the Government shall notify the contractor by AUTODIN/Advanced Records System of said failure, indicating the NSN, five digital serial number and shipping document number of failed LRUs/SRUs.
- 2.10.1 Shipping Instructions - When a demand is generated in the field, the Item Manager shall promptly notify the contractor via the AUTODIN/Advanced Record System giving shipping instructions for units to satisfy the Air Force requirements. This notice will be in the form of a Material Release Order (MRO). Upon receipt of such notification, the contractor shall ship a replacement unit from the bonded storage area to the facility designated by the Government. To the extent possible, a first-in/first-out basis shall be used in selecting units for shipment from the storage area. Such shipments will be made within one (1) working day after receipt of the MRO. Only Saturdays, Sundays and Holidays shall be considered nonworking days. The one day period shall begin at the time the MRO is received, if during normal

working hours or at the start of the contractor's normal workday on the day following notification when received during nonworking hours. The contractor shall use a Government Bill of Lading for unit shipments accompanied by a DD Form 1348-1 or DD Form 1149 for transfer of Government property accountability.

2.10.2 Point of Contact - The contractor shall provide the inventory manager, WR-ALC/MMI \_\_\_\_\_ the name and telephone numbers of individuals to be contacted to resolve inquiries involving spares, quantities, condition and transaction reconciliation data.

2.11 Consignment Coverage - Consignment Equipments which enter the Government inventory through the provisions of Sections 5 and 8 shall be covered by all provisions of the RIW and MTBF Guarantee at no increase in contract price. The warranty expiration date for such Equipments shall coincide with the warranty expiration date specified in the warranty herein.

### 3.0 GOVERNMENT OBLIGATIONS

3.1 Use Rate - With reference to the projected use rate, the Government shall apprise the contractor at least semi-annually of significant changes in flying hour and/or operating hour schedule.

3.2 The Government shall, to the extent possible:

(a) Test all units in accordance with applicable Maintenance Technical Orders prior to return to the Contractor.

(b) Furnish AFTO 350 in accordance with T.O. 00-20-2 with returned units.

(c) Use approved containers for shipment.

(d) Provide normal upkeep and periodic maintenance as authorized and identified in the applicable Technical Orders.

3.3 Install Data - The Government will provide on a monthly basis the dates on which an Equipment is initially installed in an aircraft.

- 3.4 Shipping Instructions - The Government shall provide appropriate shipping instructions to final destination for serviceable units to be shipped from the contractor's facility.
- 3.5 ECP Processing - In recognition of the high contractor motivation for total cost control effected through these warranty provisions, the Government agrees that all no-cost ECPs submitted IAW MIL-STD-480 to improve reliability and maintainability of the Equipment will receive special expeditious processing. Such ECPs shall automatically stand as approved by the Government 45 days after acknowledged receipt by the PCO unless the contractor is notified prior to that date.
- 3.6 AUTODIN - Provide an ARS AUTODIN terminal, as required, for accomplishing asset reporting and training of the contractor provided terminal operator(s).
- 3.7 RIW Payment - Pay the RIW price set forth in CLINs \_\_\_\_\_ comensurate with the delivery of CLINs \_\_\_\_\_. The Administrative Contracting Officer (ACO) shall withhold from final payment ten percent (10%) of the total RIW price until the contractor has demonstrated satisfactory completion of his obligations under the RIW provisions of this contract. The ACO may decrease the amount of the withholding as the contractor demonstrates progress in completing the requirements of the RIW.
- 4.0 CONTRACTOR OBLIGATIONS
- 4.1 Data System - The contractor shall maintain records in accordance with DD Form 1423 data requirements of DI-L-30321(A) by serial number for each Equipment under warranty. These records and associated data and documentation shall also be made available to the Government at the contractor's plant during the warranty period and for three years thereafter, or after delivery of the last kit, whichever is later, for review of their adequacy and accuracy.
- 4.2 Decal - The contractor shall place on each Equipment, in addition to the identification plate, a suitable and prominent display of information in form and content satisfactory to the Contracting Officer. The information, which must be placed

conspicuously on the outer surface of each Equipment in a way that insures visibility when Equipments are removed from aircraft, shall be:

(a) This unit is under warranty until \_\_\_\_\_.

(b) Record the dates of installation/removal and the equipment ETI readings on decal below.

(c) If this unit fails within the warranty period, process IAW Intermediate Maintenance T.O. \_\_\_\_\_.

NOTE Item 2 only required for those units with an ETI.

The above information should be on a permanent type decal with space available for a replaceable decal for installation/removal dates and ETI readings (as applicable). The proposed type and format of the display shall be submitted to the PCO for approval within 90 days after contract award.

4.3 T.O. - Contractor furnished Maintenance Technical Orders shall contain or refer to appropriate warranty information, i.e., special testing, data reporting, packaging and shipping instructions.

4.4 Configuration Management (ECPs) - The contractor shall retain responsibility for configuration management and system performance for all units under warranty.

(a) All contractor-developed and initiated ECPs to improve reliability or maintainability or to reduce repair costs shall be prepared and submitted in accordance with MIL-STD-480.

(b) The cost of preparing RIW ECPs, and for incorporation of RIW changes in all warranted equipments and for changing any technical data or spare or repair parts, support equipment (SE) and SE software and any other data or supplies procured under this contract necessitated by incorporation of these ECPs shall be borne by the contractor at no additional cost to the Government.

(c) RIW ECPs shall not be subject to the provisions of the Value Engineering Incentive Clause.

(d) All RIW ECPs submitted pursuant to this provision shall be identified as "No Cost RIW ECPs".

(e) All returned LRUs/SRUs shall be updated to the latest approved configuration in accordance with implementation schedules contained in ECPs.

(f) The contractor may, if approved in the implementing schedule of the ECP, institute field changes to effect modifications.

(g) Within one hundred and twenty (120) days after the conclusion of the warranty period, the contractor shall, at no additional cost, provide necessary modification kits and data to permit the Government to modify all LRUs/SRUs to the latest approved configuration.

(h) Contractor shall update all T.O.s to reflect latest configuration.

(i) Disapproval of any no cost RIW Class I ECP shall, in no way relieve the contractor of his obligations pursuant to this Contract.

#### 5.0 TURNAROUND TIME GUARANTEE

5.1 Guarantee - Within the average number of calendar days on a returned warranted unit as specified in Table II, the contractor shall repair, modify or replace as necessary, package and store the item in the secure storage area. STORED ITEMS shall have been preserved and packaged IAW those requirements of \_\_\_\_\_ of this contract. This turnaround time requirement shall apply to all items returned except those to which one or more of the exclusions listed in paragraph 2.6 apply. The contractor shall not be liable for time delays to the extent that failure to perform in a timely manner arises out of causes beyond the control and without the fault or negligence of the contractor. Such excuseable causes may include, but are not restricted to Acts of God or of the public enemy, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather; but in every case the failure to perform must be beyond the control and without the fault or negligence of the contractor.

5.2 Calculations - Calculations of average turnaround time shall be made every six (6) months of the warranty period for each type of unit. The first such period shall start at the time of final acceptance by the Government of the first complete production kit delivered without deviation or waiver after kit

proofing. If the average turnaround time in a six (6) month period is greater than the RIW turnaround time specified in Table II as computed from warranty data records, the Contractor will be required to provide the Government consignment spares consistent with the MBTF Guarantee values specified in Table I and in accordance with the following:

$$n = AOT \left( \frac{\bar{N}}{G} \right) (T_m - T_r) - L_p$$

where:

$n$  = number of turnaround time consignment spares to be furnished ( $n$  rounded to next higher integer).

AOT = Average Operating Time per day per unit calculated as follows:

$$AOT = \frac{\sum H_i}{\sum T_i}$$

where:

$T_i$  = Number of days each returned unit was installed

$H_i$  = Number of operating hours for each returned unit during  $T$  days

$\bar{N}$  = Average number of installed units defined as follows:

$$N = \frac{1}{6} \sum_{j=1}^6 \frac{N_j + N_{j-1}}{2}$$

$N_j$  = The number of units that are installed on the last day of each month ( $j$ ) of the six (6) month measurement period.

$N_{j-1}$  = The number of units installed on the last day of the previous month of the measurement period.



$G_i$  = Unit MTBF Guarantee value for the corresponding measurement period as specified in Table I defined as the projected total operating hours (PTOH) as specified in Paragraph 9.0 for such installed units in the Government inventory during a specified period divided by the total number of projected failures during the same period.

$T_{mi}$  = Measured average turnaround time in days is the average number of days each type of unit is in the Contractor's possession from the day it arrives at the Contractor's facility until it is physically placed in bonded storage as a serviceable unit, packaged and ready for issue.

$T_{ri}$  = Turnaround time commitment as specified in Table II.

$L_{pi}$  = Spares currently consigned to the Government through the turnaround time commitment provisions.

In calculating AOT,

(a) Operating hours shall be counted only from units which are returned during the warranty measurement period.

(b) Operating time while at the Contractor's facility shall be excluded. Returned units on which the elapsed time is not available shall be included in the calculation of the average operating hours per day by using the average operating hours of all returned units with available elapsed times.

(c) Returned units which have missing installation or removal dates shall be considered to have been installed the calculated average number of days of all returned units with available installation and removal data.

(d) Returned units with missing operating hours on date of removal shall be considered to have been operated the calculated average number of operating hours of other returned units with available operational hours.

(e) In the event that fifty percent (50%) or more the units returned during any measurement period are missing installation or removal dates, the Contractor shall not be obligated to calculate MTBF and the provisions of Paragraph 8.3 shall not apply for the measurement period.

(f) The Contracting Officer will review the Contractor's calculation and supporting data of AOT.

5.3 Consignment Delivery - A positive value of n represents the liability of the contractor for consignment spares under the repair turnaround time commitment of this RIW. The contractor shall provide such consignment spares to the government within sixty (60) days after the government notifies the contractor of the number of consignment units required if the contractor is currently producing such units, and within one hundred twenty (120) days after such notification if the units are not currently in production. However, the actual quantity of such consignment spares shall be no greater than the number of occasions when an item was required by the government and was not shipped within the required period because of insufficient assets in the contractors bonded storage area. For each consignment unit not supplied within the appropriate period, the contractor will be assessed liquidated damages at the rate of one-half percent (1/2%) of the most recent spares price for each day (or segment thereof) late in accordance with paragraph ( ) of the Default Clause. In no event however, shall the liquidated damages associated with any specific repair turnaround measurement period for any LRU/SRU be more than one hundred percent (100%) of the most recent unit price for such units. The "most recent unit price" is defined as the most recent spare price as it has been revised to reflect any contractual authorized adjustments thereto. In the event liquidated damages are paid due to late delivery of consignment spares,  $L_{pi}$  to be used in the next measurement period computations shall be increased by the amount of liquidated damages, in terms of percent of unit contract price.

5.4 Consignment Returns - In the event units have been consigned to the Government and n as calculated in paragraph 5.2 hereof is negative, all or a portion of such consignment units will be returned to the contractor according to the following formula:

$$\begin{array}{l} \text{Number of consignment} \\ \text{units to be returned} \end{array} = L_{Ci} - AOT \left( \frac{\bar{N}}{G} \right) (T_m - T_r)$$

Where:

$LC_i$  = Number of units currently on consignment through Turnaround Time Guarantee provisions.

AOT,  $\bar{N}$ , G,  $T_m$  and  $T_r$  are as defined in paragraph 5.2. In no event shall the number of consignment units to be returned exceed the actual quantity of units previously consigned. ( $LC_i$  may not necessarily equal  $L_p$ ).

#### 6.0 GOVERNMENT SPARES REQUIREMENTS

6.1 Spare Equipments - The Government will procure the quantity of spare Equipments necessary to support the quantity of Equipments procured for installation, as established within the options set forth in Section "E" of this contract. These spares are covered by this warranty.

6.2 War Readiness Material - In addition to the above referenced spares, the Government reserves the right to procure spare Equipments for use as War Readiness Material (WRM) assets. The Government reserves the right to install WRM Equipment in aircraft on a rotational basis with previously installed equipments. Equipment so procured shall be covered by the warranty. War Readiness quantities and storage sites shall be as specified by the Government.

#### 7.0 TOTAL OPERATING HOURS (TOH)

7.1 Calculation of TOH During Months 1-12 (Flying Hrs X Factor) - The Government shall provide the contractor a monthly report of the total number of aircraft flight hours for those aircraft which have undergone Equipment installation. The total aircraft flight hours will be multiplied by the number of Equipment installation per aircraft and by the factor of \_\_\_\_\_ to derive monthly Equipment operating hours. The Equipment operating time will be used as an alternative method of computing operating time for the first 12 months of the RIW Program.

7.2 Calculation of TOH After the 12th Month (ETI of Failed Units) - The operating hours shall be calculated by using the elapsed time indicator readings, installation dates, and removal dates on all equipments returned, if this information is available. The following calculation of operating time shall be made:

Total Operating Hours (TOH) =  $AOT \times \bar{N} \times D$

where:

AOT = Average unit operating time per day per unit is defined in paragraph 5.2.

$\bar{N}$  = Average number of installed units is defined in paragraph 5.2

D = Number of days in the measurement period.

It shall be assumed the AOT for all units specified in paragraph 1.3.1 is the same.

8.0 MTBF GUARANTEE

8.1 Guarantee. The contractor guarantees that each unit identified in Table I and delivered under this production contract will achieve a Mean Time Between Failure (MTBF) equal to or greater than that shown in Table I for each measurement period.

8.2 Measurement - For purposes of the MTBF measurement, failures shall include all removal and replacement actions except the following:

(a) Light bulb and ETI failures shall not be counted as relevant unit failures, however, their repair is covered by the warranty provisions where such repair would require violation of the integrity of the unit.

(b) Any unit which is exempt from repair or replacement due to the conditions of the allowable exceptions stated in paragraph 2.6.

(c) Removals to accomplish modification resulting from approved ECPs.

(d) Removals for the purpose of gaining access to other unrelated equipment.

(e) Unverified failures up to 10% of returned units.

- 8.3 MTBF Calculations. For each type of unit as specified in 1.3.1, the contractor shall calculate the unit MTBF achieved over the previous six month period. The first such measurement shall be made (6) six months after final Government acceptance without deviation or waiver of the first production kit delivered after kit proofing. MTBF computations shall be as follows:

$$M_i = \frac{TOH_i}{F_i}$$

$M_i$  = achieved MTBF of the  $i^{th}$  type unit, as defined in paragraph 1.3.6.

$TOH$  = TOH as calculated in paragraph 7 times Quantity per Installation (QPI) of N.

$F_i$  = number of failures (as defined in paragraph 1.3.5 and as further explained in paragraph 8.2) of the  $i^{th}$  type unit as defined in paragraph 1.3.1 occurring during the measurement period.

- 8.4 Commitment - In the event that an achieved MTBF (M) at the end of the second measurement period (6-12 months) and succeeding periods is less than the corresponding MTBF guarantee value (G) stated in Table I, the contractor shall furnish the Government at no increase in contract price the following:

(a) Engineering analysis (including failure modes and effects analysis) to determine the cause for the nonconforming MTBF.

(b) No Cost to the Government Engineering Change Proposal(s) pursuant to paragraph 4.4.

(c) Additional "pipeline" unit spares on a consignment (no-charge loan) basis or payment for not providing consignment spares in accordance with paragraph 8.7 for each type unit.

- 8.5 Consignment Calculations - The quantity of additional spares shall not exceed  $m$  as computed by the following formula:

$$m_i = (A_i \times S_i) - S_{pi}$$

where:

$m_i$  = The maximum number of  $i^{th}$  type MTBF pipeline consignment spare units (rounded to the next higher whole number)

$S_{pi}$  =  $i^{th}$  type spares currently consigned to the Government through the MTBF guarantee provisions.

$A_i$  = The number calculated for the  $i^{th}$  type unit as follows:

$A_i = \frac{G_i}{M_i}$  (if  $A$  is greater than 1, it shall be redefined as 1)

$G_i$  = Specified  $i^{th}$  type unit MTBF Guarantee value for the corresponding measurement period as specified in Table I

$M_i$  = The achieved MTBF of  $i^{th}$  type unit.

$S_i$  = "Target" spares level of the  $i^{th}$  unit calculated as follows:

$$S_i = N \left( \frac{23 + Tr_i}{G_i} \right) AOT + 1.65 N \sqrt{\left( \frac{23 + Tr_i}{G_i} \right) AOT}$$

where 23 represents the number of pipeline days to and from the contractor's facility and where  $Tr_i$  is the required Contractor turnaround time as defined in Paragraph 5.2 and as specified in Table II. AOT represents the average operating time of one (1) installed unit per day as defined in paragraph 5.2. If  $m$  is negative for a particular type of unit, the provisions of paragraph 8.9 shall apply. The average number  $N$  of each type unit shall be calculated as set forth in paragraph 5.2.

- 8.6 Consignment Determination - The objective of the consignment units is to support the pipeline flow pending improvement of the achieved MTBF. The Procuring Contracting Officer shall determine the actual number of consignment spares to be provided by the contractor in the event the unit MTBF guarantee value is not achieved. In no event shall the actual number exceed that computed by the formula in paragraph 8.5.

8.7 Consignment Delivery - A positive value of  $m$  represents the liability of the contractor for consignment spares under the guaranteed MTBF commitment of this RIW. The contractor shall provide such consignment spares to the government within sixty (60) days after the government notifies the contractor of the number of consignment units required if the contractor is currently producing such units, and within one hundred twenty (120) days after such notification if the units are not currently in production. However, the actual quantity of such consignment spares shall be no greater than the number of occasions when an item was required by the government and was not shipped within the required period because of insufficient assets in the contractors bonded storage area. For each consignment unit not supplied within the appropriate period, the contractor will be assessed liquidated damages at the rate of one-half percent (1/2%) of the most recent spares price for each day (or segment thereof) late in accordance with paragraph ( ) of the Default Clause. In no event, however, shall the liquidated damages associated with any specific repair turnaround measurement period for any LRU/SRU be more than one hundred percent (100%) of the most recent unit price for such units. The "most recent unit price" is defined as the most recent spare price as it has been revised to reflect any contractual authorized adjustments thereto. In the event liquidated damages are paid due to late delivery of consignment spares,  $S_{pi}$  to be used in the next measurement period computations shall be increased by the amount of liquidated damages, in terms of percent of unit contract price.

8.8 Consignment Returns - In the event units have been consigned to the Government and " $m$ " as calculated in paragraph 8.5 is negative during any one measurement period, all or a portion of the consignment units will be returned to the Contractor according to the following formulas:

$$\text{Number of Consignment} = S_{ci} - \left[ \frac{G_i}{M_i} - 1 \right] \times S_i$$

where:

$S_{ci}$  = Number of units currently on consignment through MTBF Guarantee provisions,  $G_i$ ,  $M_i$ ,  $S_i$  are defined in paragraph 8.5

In no event shall the number of consignment units to be returned exceed the actual quantity of units previously consigned ( $S_{ci}$ ). ( $S_{ci}$  may not necessarily equal  $S_{pi}$ ). Assessed liquidated damages are not refundable.

8.9 Consignment Coverage - Consignment units provided pursuant to either paragraphs 5.2 or 8.5 which are in the Government inventory shall be subject to all provisions of the contract and the RIW at no increase in contract price. The warranty expiration date for such units shall coincide with the warranty expiration date specified in the warranty herein. All consignment units required at the end of the warranty period, as determined by paragraph 8.5 shall become the property of the Government at no additional cost to the Government.

8.10 Final Measurement Calculation - Within sixty (60) days after the expiration of the warranty period, the Contractor shall notify the PCO in writing of any consignment units or payment due the Government. Based upon Government approval of the final measurement calculation, the contractor shall deliver all consignment units due, or with the approval of the PCO, pay the Government one hundred percent (100%) of the most recent price as defined in paragraph 5.3 and 8.7.

9.0 PRICE ADJUSTMENT OF RIW

Beginning with the third year and annually thereafter, if the calculated ratio of the actual total operating hours (ATOH) to the projected total operating hours (PTOH) for the preceding period is less than 0.95, a downward adjustment in warranty price shall be made for all operating hours less than the PTOH. If the ratio is greater than 1.05, an upward adjustment in warranty price shall be made for all operating hours exceeding PTOH. The cost per operating hour adjustment factor shall be \$      \* (Total RIW price divided by total projected TOH.) The PCO will review with the contractor the calculation and supporting data for the total operating hours. Failure to agree shall be treated in accordance with the Dispute Clause.

Assuming equipment installation to follow equipment delivery by sixty (60) days, the PTOH for each twelve (12) month period for all installed equipments are as follows:



1-12 months after start of warranty	_____
13-24 months after start of warranty	_____
25-36 months after start of warranty	_____
37-48 months after start of warranty	_____
49-60 months after start of warranty	_____

\*Data to be provided by offeror

10.0

RIW CALCULATIONS

As required by paragraphs 5.2, 5.4, 8.3, 8.4, and 8.8 example calculations have been made by the offeror using an achieved turnaround time ( $T_m$ ) of twice (2) the guaranteed turnaround time ( $T_r$ ) and an achieved MTBF (M) of one half ( $1/2$ ) of the guaranteed MTBF (G) and are shown as figure 1\* of this provision.

\*Data to be supplied by offeror.

TABLE I  
MTBF GUARANTEE

<u>LRU/SRU NOMENCLATURE</u>	<u>LRU/SRU MTBF*</u>					MONTHS
	1-12	13-24	25-36	37-48	49-60	
1.	_____	_____	_____	_____	_____	hours
2.	_____	_____	_____	_____	_____	hours
3.	_____	_____	_____	_____	_____	hours
4.	_____	_____	_____	_____	_____	hours

\*Increasing MTBF guarantee hours which reflect reliability growth are encouraged; however, the offeror shall fill in MTBF hours for each LRU/SRU for each period.

TABLE II  
TURNAROUND TIME GUARANTEE

<u>LRU/SRU NOMENCLATURE</u>	<u>LRU/SRU** TURNAROUND TIME</u>
1.	_____ Days
2.	_____ Days
3.	_____ Days
4.	_____ Days

\*\*Not to exceed 22 days

## APPENDIX E

### RIW CONTRACT OUTLINE

#### I GENERAL

- Basic Requirements
  - o Correct or replace failed equipment at no cost
  - o Contractor is motivated to make no-cost changes to improve R&M
  - o Can software be included? BIT?
  - o Can RIW be initiated after FSD on production equipment?
- Period/Use Rate
  - o Criteria for determining start and duration
- Asset Management
  - o Government responsibility
- Consignment Spares
  - o No-charge/loan spares function of observed MTBF and contractor turnaround time
- Configuration Update
  - o Given the Government is expediting no-cost ECP's, how is configuration control maintained? What is reasonable ECP processing time?
- Definitions:

Are the standard definitions applicable to RIW? Are they sufficiently understood?

- o LRU
- o SRU
- o Equipment to be warranted:
  - .
  - .
  - .
- o Reporting Period
- o Failures
- o MTBF
- o Guaranteed MTBF
- o Measured MTBF
- o Total Operating Hours (TOH)
- o Elapsed Time Indicator (ETI)

## II STATEMENT OF CONTRACTOR WARRANTY

- Warranty:
  - o Free from defects in design, material and workmanship while operating in intended environment for warranty period.
- Rights and Obligations
  - o Are there defect exclusions, e.g., non-discovered defects prior to acceptance?
  - o Special, consequential or incidental damages
- Repair or replace

- o Inspections at contractor repair facility for failure verification and corrective action verification
- o Who pays for packaging and shipping of failed warranted items?
- Warranty Coverage
  - o Determination whether exclusions apply. Contractor must provide "Clear and convincing evidence," but Government decides.
- Non-Correctables
  - o Government decides correctability and disposition of non-warranted equipment.
- Exclusions
  - o Fire, explosion, Acts of God, . . .
  - o Unauthorized maintenance, excessive use, abuse, tampering
  - o Clear and convincing evidence
  - o Determining authority
- Seals
  - o Void conditions
  - o Clear and convincing evidence
- Repair Parts
  - o CFE until incorporated, then Government property. Removed parts property of contractor
- Unverified failures
  - o Packaging, shipping, testing, re-shipping responsibility

- o All unverified failures over X% shall be counted as failures for calculation of MTBF.
- Secure storage
  - o ASPR Appendix B, "Manual for Control of Government Owned Property in Possession of Contractors"
  - o Bonded storeroom at contractors facilities
- Distribution point
  - o Record keeping
- Transaction reporting
  - o Contractor handles data per DI-L-30320 (A)
- Failure notification
  - o Government to notify contractor via AUTODIN
- Shipping instructions
  - o Government identifies needed units via AUTODIN and gives shipping instructions
  - o Response time (# working days, e.g., 1)
- Point of contact
  - o Identify contractor personnel
- Consignment coverage
  - o Warranty expiration

### III GOVERNMENT OBLIGATIONS

- Use Rate
  - o Government advises of significant charges in use rate periodically (e.g., semi-annually)
  - o Government must test and maintain equipment per T.O.

- Install data
  - o Initial install dates, monthly
- Shipping Instructions
- ECP Processing
  - o Expedite no-cost; automatically approved after X days, e.g. 45
- AUTODIN
  - o Provide terminal
- RIW payment
  - o Schedule per CLIN
  - o Withhold X% for completion of RIW provisions (e.g., 10%)

#### IV CONTRACTOR OBLIGATIONS

- Data System
  - o Record data for each warranted item
  - o Availability to Government (during and after)
- DECAL
  - o Warranty date
  - o Installation/removal dates, ETI readings
  - o Failure instructions
- Tech Order (TO) with appropriate warranty data
- Configuration Management (ECP's)
  - o Contractor R&M ECP's IAW MIL-STD-480

- o RIW ECP disapproval does not relieve requirements. What rational would be required for disapproval?
- o Cost of RIW ECP's and changes to tech data, spares, SE, SE software - all borne by contractor.
- o RIW ECP's not included in Value Engineering Incentive Clause
- o All returned LRU/SRU's shall be updated to latest configuration IAW ECP's
- o Contractor may institute field changes, if approved in ECP
- o Provide mod kits and data within 120 days after warranty, to permit Government to mod all LRU/SRU's to latest configuration
- o Update all TOs to latest configuration

#### V TURNAROUND TIME GUARANTEE

##### - Guarantee

- o Repair, modify or replace, package and store within specified number of calendar days, by LRU/SRU
- o Excusable causes for delay
- o Is it workable in wartime?

##### - Calculations

- o Compute average turnaround time by LRU/SRU every X months (e.g., 6)
- o Penalty: If over spec, provide consignment spares per contract
- o Average Operating Time (AOT) per day per unit (exclude time outside warranty and at contractor's facility)
- o Average missing data, up to X% (e.g., 50%). If more than that missing, no MTBF calculation required



- Consignment Delivery
  - o Within X days of notification (e.g., 60, or 120 if units not in production)
  - o Spares limited to no. of occasions of insufficient assets in storage (in required period)
  - o Penalty: for each unit not so supplied, pay liquidated damages at X% (e.g., 1/2%) per day of most recent spares price ( 100% max.)
- Consignment Returns
  - o If spares exceed need, excess units will be returned
  - o Excess computation per algorithm

#### VI GOVERNMENT SPARES REQUIREMENTS

- Spare equipments
  - o Procure per contract option
- War Readiness Material (WRM)
  - o Procure in addition to contract options; covered by warranty

#### VII TOTAL OPERATING HOURS (TOH)

- What information is needed for determining TOH?
  - o initial period
  - o later periods.

#### VIII MTBF GUARANTEE

- Are they useful adjuncts to RIW?
- GUARANTEE
  - o MTBF/Unit more than values specified

- o How are step values determined?
- Measurement
  - o Count all Remove/Replace (R/R) actions except:
    - Light bulbs, ETI failure
    - Allowable exceptions
    - Removal for approved modification
    - Removal for access to other equipment
    - Unverified failures up to X% (e.g., 10%)
- MTBF Calculations
  - o Measurement period, e.g., 6 months, possibly with provisions to ensure adequate data.
  - o First measurement X mo. after final government acceptance w/o deviation or waiver
- Commitment
  - o If MTBF less than guaranteed, contractor:
    - Provides engineering analysis (including FMEA)
    - Provides no-cost ECP's
    - Provides additional "pipeline" spares per contract
- Consignment Calculations
  - o Algorithm for determining no. of spares required
- Consignment Determination
  - o Procurement Contracting Officer (PCO) decides, but limited by algorithm

- Consignment Delivery
  - o 60 or 120 days (in/out production)
  - o Spares limited to no. of occasions of insufficient assets in storage
  - o Penalty: Pay X% (e.g., 1/2%) per day of most recent spares price to 100% max.
- Consignment Returns
  - o Excess spares to be returned according to algorithm
- Consignment Coverage
  - o Inventoried spares warranted per contract
  - o Consignment units required at end of warranty period become Government property.
- Final Measurement Calculation
  - o Within X days (e.g., 60) of end of warranty, Contractor shall notify Government (PCO) of consignment units or payment due Government
  - o Subject to Government approval, conclude contract

#### IX PRICE ADJUSTMENT OF RIW

- Divide actual total operating hours by projected total operating hours for period
  - o If ratio less than 0.95, adjust warranty price downward
  - o If ratio more than 1.05, adjust warranty price upward

o Specify total operating hours projected:

1-12 mo \_\_\_\_\_

13-24 \_\_\_\_\_

25-36 \_\_\_\_\_

37-48 \_\_\_\_\_

49-60 \_\_\_\_\_

X RIW CALCULATIONS

- Offeror provides examples for

1) Achieved turnaround time 2X guaranteed value

2) Achieved MTBF 1/2 guaranteed MTBF value

## APPENDIX F

### ADDITIONAL WARRANTY/INCENTIVE ISSUES AND PROBLEMS

- o Can RIW be initiated after FSD on production equipment?
- o Does the implementation and management of RIW entail special management skills?
- o What has been the experience in applying RIW pricing theory?
  - . Ability to estimate organic maintenance cost.
  - . Ability to determine contractor risks.
- o Has experience shown any evidence of excessive prices being charged for contingent liabilities associated with warranties?
- o Is RIW a ploy by industry to try to get paid for fixing a system, or to make it meet requirements?
- o What proof do we have that RIW works? Can we compare RIW experience with what would have been with Air Force maintenance? How do we find out?
- o Sample RIW contracts are available. Have any been used or tailored for a program?
- o Has there been a problem with users voiding provisions of RIW contracts? Has responsibility for defects been debated?
  - . Broken seals                      . Damage
  - . Tampering                        . Unauthorized repairs
- o Has the enforcement of warranty rights been difficult?

APPENDIX G

LETTER (17 NOVEMBER 1980)

Commander  
Headquarters, Electronic Systems Division  
Hanscom AFB, MA 01731

Attention:

Subject: JTIDS Reliability Improvement Warranty (RIW) Workshop

Gentlemen:

The JTIDS Joint Program Office (JPO) has asked MITRE's JTIDS Project to investigate the merits of Reliability Improvement Warranty (RIW) for possible incorporation into new and existing JTIDS acquisitions. As part of this investigation we have decided to convene a RIW workshop at MITRE on 9-10 December. We have invited a small number (about 25) Air Force and government personnel who have had experience with RIW, or other incentives, on their programs. We plan to run the meetings as informally as possible, consistent with the objective of maximizing information exchange and participant benefit. We are especially interested in interchanges on the pros and cons, likes and dislikes, and basic effectiveness of RIW procurements. We would like to develop an answer to the question "Does RIW, or any incentive plan, provide improved field reliability and lower life cycle cost?". We have developed a tentative agenda (attached), but will entertain suggested changes.

While the meetings probably won't require delving into classified areas, still, to avoid problems should something classified come up, we have classified the workshop Secret and ask that you submit your clearance to MITRE's Security Office.

We are looking forward to some stimulating sessions and hope you can participate. If there are any questions, please contact Mr. S. A. Greenberg or Mr. W. P. Crossley at 617-217-3347 or -3289, respectively, or via Autovon: 478-1001 and the MITRE extensions (3347, 3289). Also for our planning, will you please let us know if you plan to be here.

The meetings will start at 0900 Tuesday, 9 December, in the Green Conference Room in MITRE's "A" building.

Very truly yours,

William F. Lynch  
Associate Department Head, D61

WFL

Attachment

Attachment

TOPICS FOR DISCUSSION

1. Experience with warranty or incentive programs.
2. Types and characteristics of warranties and incentives.
3. Determination of performance criteria.
4. Establishment of incentives, e.g., dollars or % cost.
5. Determination of warranty price.
6. Determination of warranty period.
7. RIW problems, e.g., administrative, logistics, . . . .
8. Transitioning from contractor to government maintenance after warranty period.
9. Planning for RIW. Rules. Problems.
10. Effect of RIW on production RDT.
11. Comparison of warranty price with organic repair cost.
12. RIW impact on LCC.



# APPENDIX H TABLE OF ACRONYMS

ACO	Administrative Contracting Officer
ALC	Air Logistics Center
ASIT	Adaptable Surface Interface Terminal
ASPR	Armed Services Procurement Regulation
CDRL	Contract Data Requirements List
BIT	Built In Test
CFE	Contractor Furnished Equipment
CLIN	Contract Line Item Number
COD	Correction of Deficiencies
DT&E	Development Test and Evaluation
ECP	Engineering Change Proposal
ESD	Electronic Systems Division
ETI	Elapsed Time Indicator
FSD	Full Scale Development
FY	Fiscal Year
HIT	Hughes Improved Terminal (Class 1)
IAW	In Accordance With
ICS	Interim Contractor Support
IOT&E	Initial Operational Test and Evaluation
JPO	Joint Program Office
JTIDS	Joint Tactical Information Distribution System
LCC	Life Cycle Cost
LRIP	Low Rate Initial Production
LRU	Line Replaceable Unit
MTBCF	Mean Time Between Critical Failures
MTBF	Mean Time Between Failures
MTBM	Mean Time Between Maintenance
O&S	Operation and Support
PCO	Principal Contracting Officer
RDT	Reliability Demonstration Test
RIW	Reliability Improvement Warranty
SRU	Shop Replaceable Unit
TAAF	Test Analyze and Fix
TO	Technical Order
TSPR	Total System Performance Responsibility
VECP	Value Engineering Change Proposal
WIC	Warranty Incentive Center